

# Exploring Body Fat Percentage Cut-off values and Anthropometric Variations in Body Image Dissatisfaction: A cross-sectional approach on Bengali Adolescent schoolgirls

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## INTRODUCTION

- Body image is the self-directional feeling and approach towards one's physical aspects of body related to weight, shape, size that can be positive or negative. Negative perception is termed as '**body image dissatisfaction**' (BID). It mainly arises during adolescence period and females [1].
- Physiological and psychological alteration marked by pubertal development increases psychological burden of weight gain. Immature adolescents are easily provoked by social advertisement of slimmest beauty [2].
- Obesity is rising globally including in India that triggers for weight reduction and dieting [3].
- Failure to achieve the perfectionism leads to BID [1].
- It results in depression, anxiety, physical disturbances, emotional disturbances, appearance concern, disturbed eating pattern, unhealthy weight control behaviors [1,4].



Figure 1: Body Image Dissatisfaction

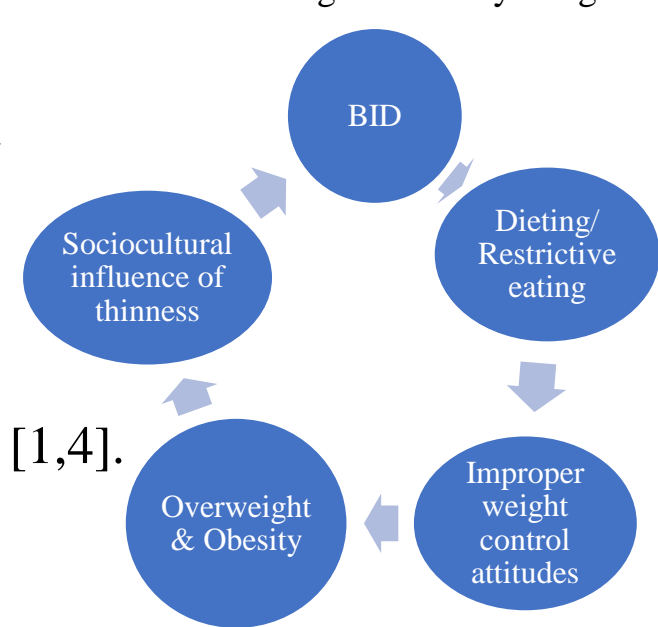


Figure 2: Vicious cycle of obesity and BID

## OBJECTIVES

There are very few number of studies regarding BID among Bengali adolescent girls and cross-sectional studies are needed to explore cultural and geographical prevalence of diseases or health problems. Therefore, the study was conducted in North 24 Pargana district of West Bengal with the following broad objectives-

- To observe prevalence of BID among Bengali adolescent school girls
- To evaluate anthropometric differences of participants with and without BID
- To determine BFP cut-off values
- To observe prevalence of obesity among them

## METHOD & MATERIALS

- Sample size calculation [5]. Target was 424
- Obtained Ethical clearance from the institution
- Random selection of secondary and higher secondary schools from all 4 sub-divisions of the district
- Permission was sought, 48 schools were randomly selected
- Random selection of 9 students of class IX-XII from each school
- Study process was described & consent was obtained
- Assessment of BID by BSQ-34 [6]
- Anthropometric measurements b, c, d [7], g [8], h [9]
- Statistical analysis was performed in SPSS 24

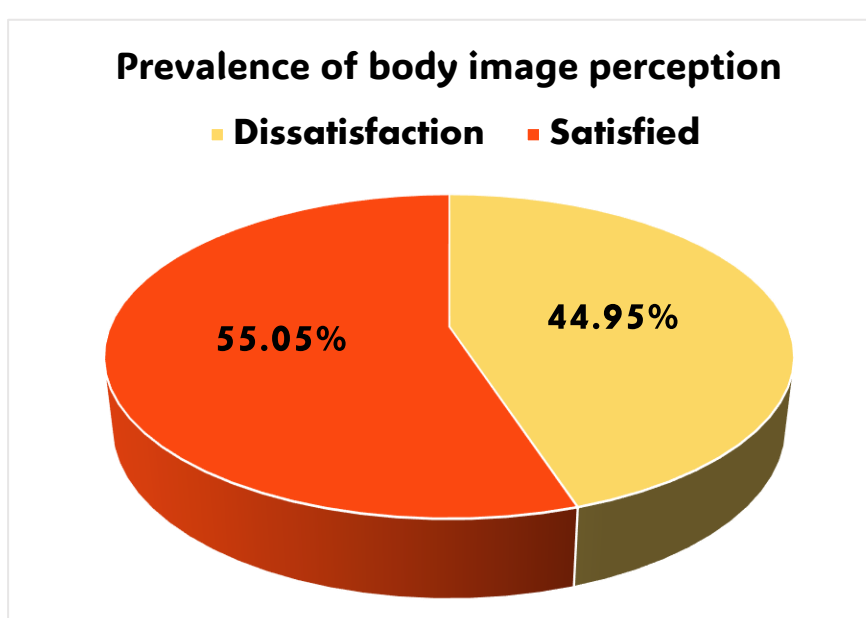
## CONCLUSION

WC was the most significant contributor of BID indicating waist size as the most notifiable measurement by adolescent girls. The cross-sectional design of the study did not represent whole Bengali adolescent community, so the study had some limitations and cannot be generalized. This BFP cut-off value is a valuable piece of information for further determination and nation-wise comparison and also helped to find out prevalence of obesity. As a whole, it uncovers the prevalence and anthropometric status of Bengali adolescent schoolgirls of the district along with BFP cut-off value, which will help healthcare practitioners in detection, treatment and diet planning during further investigation of BID.

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Figure 3: Graphical presentation of prevalence of body image perception



Most BID cases were from rural areas There is no geographical limitation of BID. This result and our finding fall within global prevalence of 40-60% [10].

## Determination of BFP cut-off on basis of BID:

Figure 3: ROC curve of BFP

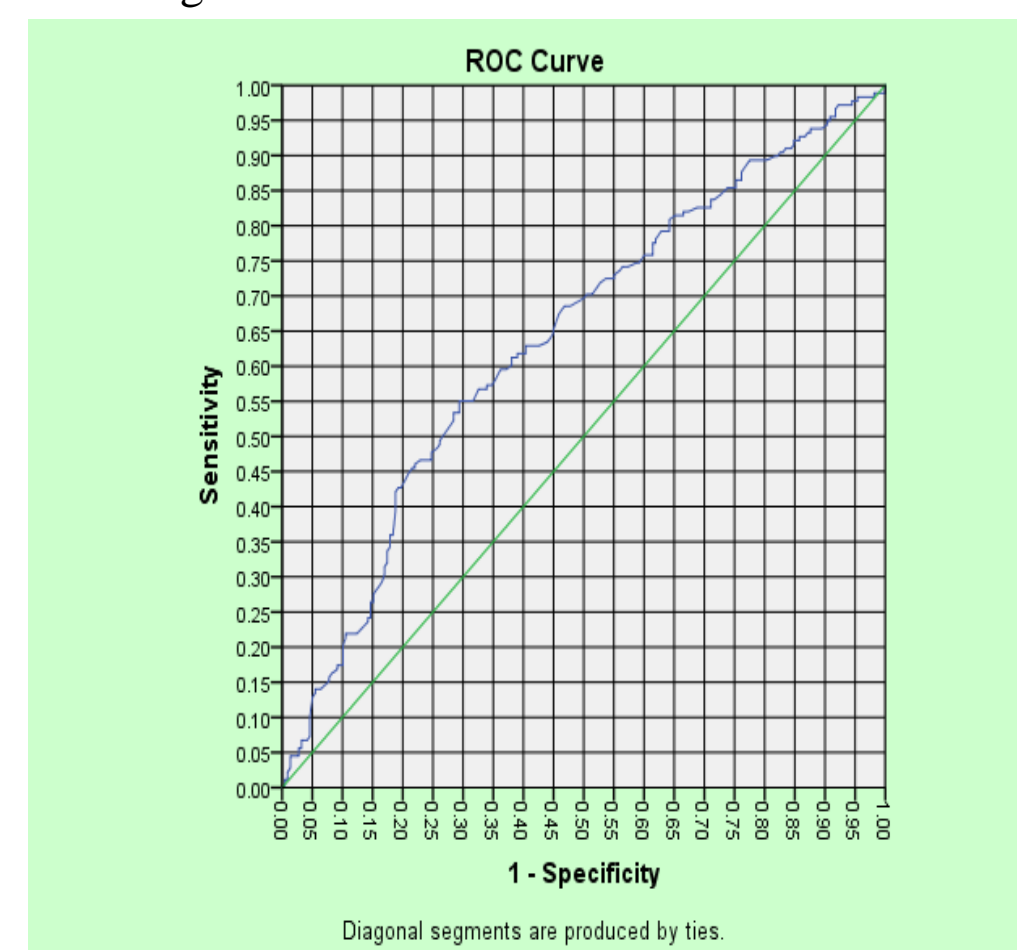


Table 3: Test result

Area	Std. error	Sig.	Confidence interval	
			Lower	Upper
0.639	0.028	<.000	0.585	0.694

- Based on the diagonal line (reference line), **63% area was covered under the curve.**
- The **sensitivity and specificity were both equal to 0.65** (1-specificity = 1-0.45 = 0.65). Thus, the **corresponding value of BFP at this point is 26.36.**
- BFP <26.36, was marked as 'low-fat'.**
- The median value of BFP >26.36 was 29. The BFP value between cut-off and median values i.e., **26.36 - 29** was regarded as '**normal fat**' and BFP value >29 was considered as '**high-fat**'.
- McCarthy determined age-wise BFP cut-off values in centile chart [11]. But it is difficult to interpret for a wide age range. So, this method is easier way.

## RESULT & DISCUSSION

Table 1: categorization of prevalence of BID according to place

Body perception	Place of residence		Total (n, %)
	Rural (n, %)	Urban (n, %)	
Dissatisfied	92 (51.68%)	86 (48.31%)	178 (44.95%)
Satisfied	119 (54.58%)	99 (45.41%)	218 (55.05%)

Table 2: Anthropometric differences between body image perception groups

Parameters	Dissatisfaction (n=178)	Satisfaction (n=218)	P value
	Mean ± SEM		
BAZ	0.78 ± 0.09	-0.01 ± 0.07	<0.000
WC	77.22 ± 0.91	69.25 ± 0.63	<0.000
HC	93.72 ± 0.97	85.53 ± 0.64	<0.000
BFP	27.64 ± 0.32	25.89 ± 0.29	<0.000

BAZ= BMI-for-age-z score, WC= waist circumference, HC= hip circumference, BFP= body fat percentage

BID participants have significantly higher anthropometric values in all the parameters. This indicated the tendency of obesity among them.

Figure 4: Graphical presentation of comparison of anthropometric variables based on BFP categories

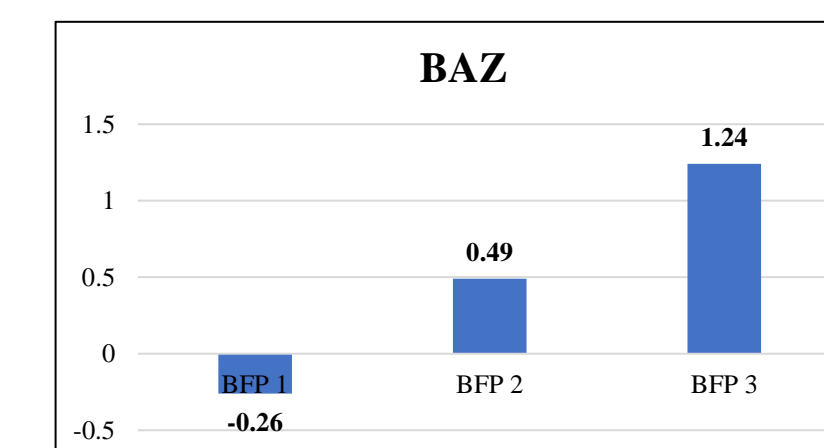


Figure 4a

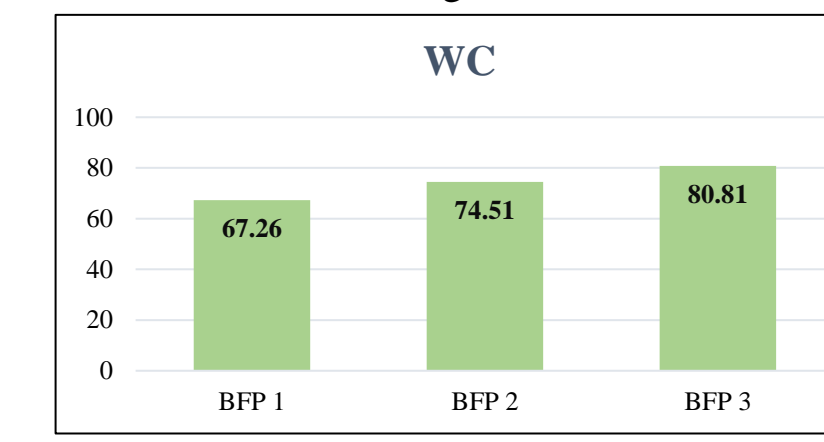


Figure 4b

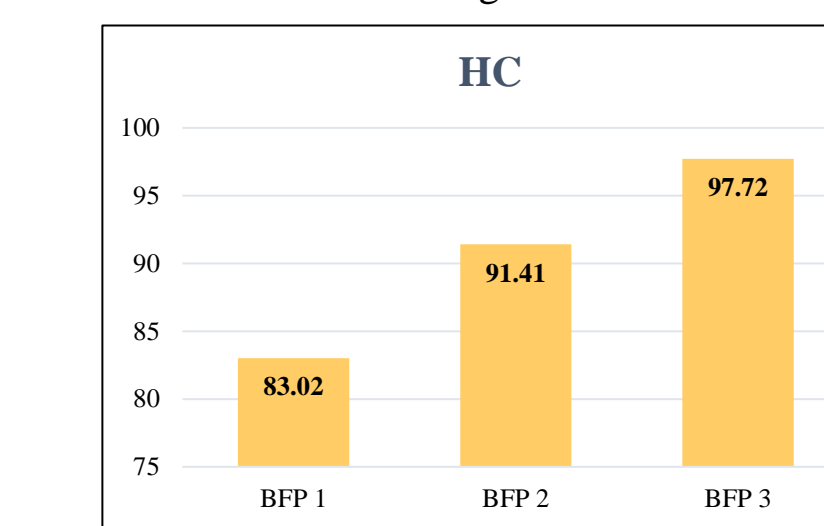


Figure 4c

## Prevalence of obesity by BAZ and BFP:

### By BFP

Underfat= 182 (45.95%)  
Normal= 110 (27.77%)  
Overfat= 104 (26.26%)

### By BAZ

Thinness= 16 (4.04%)  
Normal= 258 (65.15%)  
Overweight & Obesity= 122 (30.80%)

- Prevalence of obesity is lower by BFP categorization.

## Semi-partial correlation analysis

Table 4a: Bivariate correlation analysis

Parameters	WC	HC	BFP	BAZ	BID Score
WC	Pearson Correlation 1	.908**	.509**	.748**	.389**
	Sig. (2-tailed)	.000	.000	.000	.000
HC	Pearson Correlation	.908**	1	.758**	.366**
	Sig. (2-tailed)	.000	.000	.000	.000
BFP	Pearson Correlation	.509**	.509**	1	.255**
	Sig. (2-tailed)	.000	.000	.000	.000
BAZ	Pearson Correlation	.748**	.758**	.551**	1
	Sig. (2-tailed)	.000	.000	.000	.000

All variables are positively and significantly correlated. Among them, WC had the most significant relation. So, the effect of other variables were controlled to observe the sole effect of WC on BD by semi-partial (part) analysis.

Table 4b: Coefficients<sup>a</sup>

Model	Standardized Coefficient Beta	t	Sig.	Correlation		Collinearity diagnosis
				Zero-order	Part	
1	(Constant)	-	-1.354	.176	-	-
	WC	.389	8.383	.000	.389	.389**
2	(Constant)	-	.601	.548	-	-
	WC	.279	3.998	.000	.389	.185**
	BAZ	.148	2.118	.035	.356	.098

a. Dependent variable: BID score

Table 4c: Excluded variables<sup>a</sup>

Model	Beta In	t	Sig.	Partial Correlation	Collinearity statistics	
						VIF
1	BAZ	.148 <sup>b</sup>	2.11	.035	.106	2.274
	HC	.074 <sup>b</sup>	.670	.504	.034	5.717
	BFP	.077 <sup>b</sup>	1.43	.153	.072	1.350
2	HC	.009 <sup>c</sup>	.076	.940	.004	6.216
	BFP	.047 <sup>c</sup>	.844	.399	.043	1.481

a. Dependent variable: BID score  
b. Predictors in the model: (Constant), WC  
c. Predictors in the model: (Constant), WC, BAZ

In model 1 only WC was entered and it showed the maximum correlation coefficient r= 0.389. In model 2, WC and BAZ were used by controlling the effect of HC and BFP. Then the correlation coefficient was reduced to r= 0.185.

The image perception is mainly regarded in terms of body diameter of WC and then body weight. Though fat accumulation is a general phenomenon at this age group, the quantifiable measurement is not possible for them and effect of fat gain is reflected by weight gain or increase in diameter.